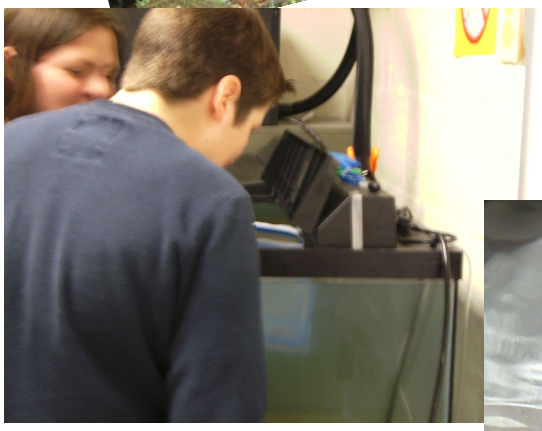
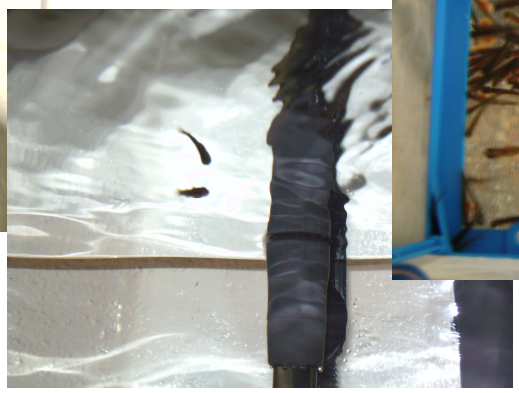
Trout Time





A Trout in the Classroom 7th Grade Curriculum

Developed by Robin Phillips and Kristen Gunter

Introduction:

This is my second year with a trout tank in my classroom. With the help of my student teacher, Robin Phillips, I have been able to do a lot more with it this year. I have compiled the lessons we have done or hope to do in order to help other teachers incorporate the tank into their science curriculum.

Trout Time:

Each Friday we spend 30 minutes to one hour learning about the trout. These are the lessons you will find on the following pages.

Trout Tank Update:

Each morning two students come in on a rotation basis to check pH, ammonia, temperature, and look for dead eggs or fish. They record all data in a notebook and update the information on a bulletin board that was decorated for Trout in the Classroom (see page 26 and 27). They also post the survival numbers on a sign called Trout Count. This bulletin board is where the students get their information for their journal updates.

Journal:

Each student keeps a trout journal where we diagram or illustrate, keep data and write journal entries. I purchased these from Bare Books, but any type of notebook would be fine.

Lesson One – Tank Set – Up

1. Journal Set Up

   Set up some type of notebook as the student's trout journal. This is where the student will journal, collect data and illustrate.

This is where you sketch, diagram, or graph	Weekly Update Date: pH: Range: Ammonia: Trout Count: _____ _____ _____ _____ _____ _____

2. Draw tank set up and label parts.

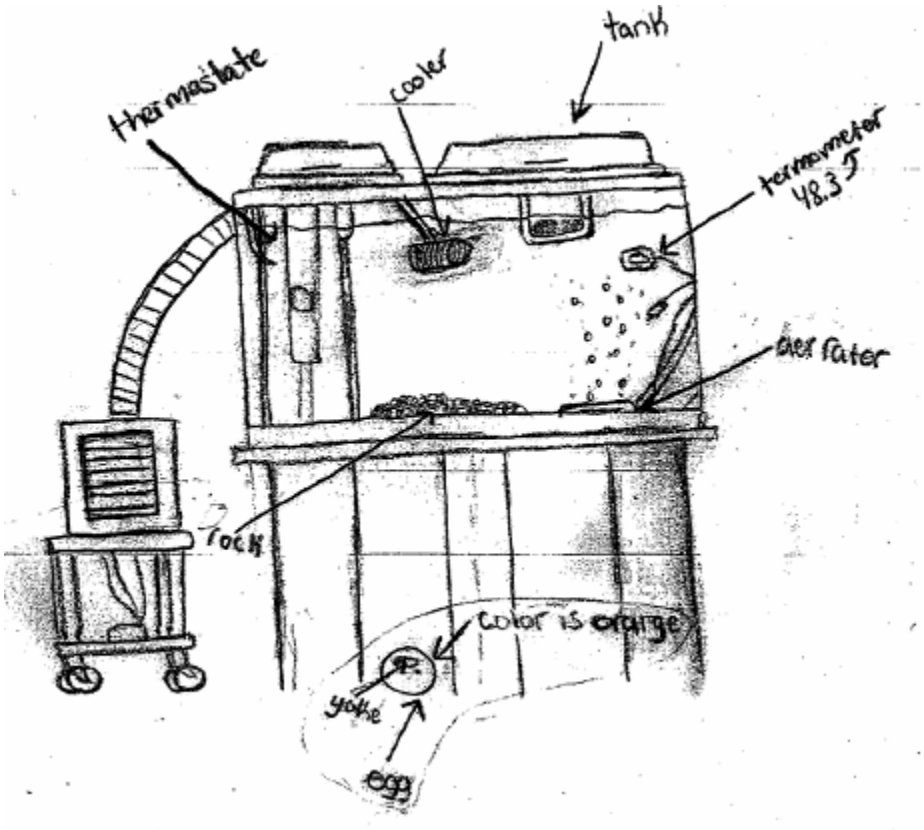


Figure 1. Student (Tyler Anderson) drawing of tank setup and trout egg.

3. Draw an egg.

   a. Place an egg in a Petri dish at each student group. Allow the students to observe and sketch the egg. Do not leave the egg out long because the temperature will rise.

4. Discuss how the tank mimic's a trout's natural environment.

   a. Aerator – high oxygen content
   b. Chiller – cold mountain water

c. Filter – clean water
d. Pump – moving water
e. Gravel – camouflage for eggs and fish

5. Discuss Tank Tests

    a. pH – Allow students to do a pH test of the water at their groups.
    b. Ammonia – Teacher models how to do the ammonia test.
    c. Looking for Dead Eggs or Fish – Discuss fungus and why the eggs should be removed before the fungus spreads.
    d. Explain student checks – Train two students to check the pH, Ammonia, Temperature, and look for dead eggs or fish. The students track this in a notebook for tank tests and trout mortality. These tests must be done each day. Students are in charge of training each other. One student rotates off while another rotates on to learn each day.

6. Update Trout Data in Journal

7. Journal Entry: How does our tank mimic a trout's natural environment?

Lesson Two: Trout Life Cycle

1. Draw Life Cycle in journal – See page 5.

2. Compare Trout life cycle to the human life cycle

    a. Eggs = Fetus
    b. Alevin = Infant
    c. Fry = Toddler
    d. Fingerling = Child/Teen
    e. Adult = Teen/Adult

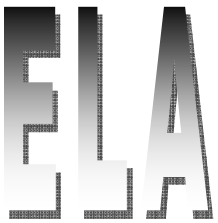
3. Life Cycle Game – See page 6

4. Discuss survival rate of trout.

    a. If 2000 eggs are deposited in the wild, then roughly 200 eggs will make it to adult trout.
    b. Discuss why the eggs will not live. (predators, pathogens, not fertilized, etc.)

5. Update Trout Data in Journal

6. Journal Entry: How will our survival rate in the tank compare to the survival rate in the wild?



Write birth announcements and or obituaries.

Trout Life Cycle

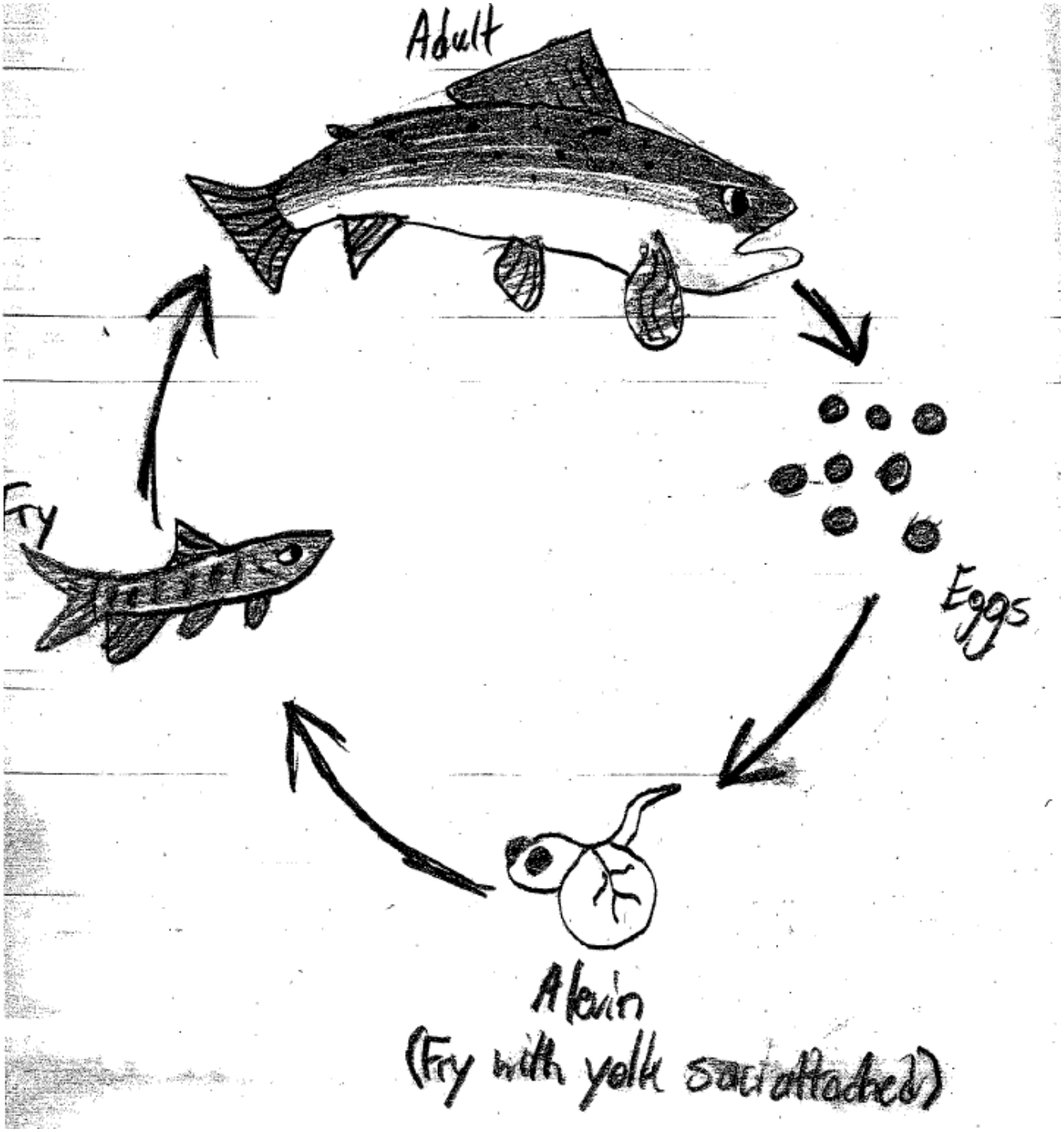


Figure 2. Student (Austin Haulbrook) drawing of trout lifecycle

Life Cycle Game

a. *Each student chooses a number 1-6.*

Egg:

1. It just rained and you died when the pesticides that the farmer sprayed on his crops near your home washed into your stream.
2. Congratulations! You hatched!
3. Congratulations! You hatched!
4. The weather has been extremely warm recently, heating the water to 65 degrees. That is too warm for trout eggs.
5. You weren't even fertilized.
6. Congratulations! You hatched!

b. *Hatched eggs remain standing.*
c. *Those students choose a number 1-6*

Alevin:

1. Congratulations! You have completely absorbed your yolk sac!
2. Your yolk sac burst when something hit it.
3. Heavy rain washed a bunch of sediment into the stream and covered you up.
4. A dragonfly larva ate you.
5. Congratulations! You have completely absorbed your yolk sac!
6. You were born with a genetic mutation that causes you to die.

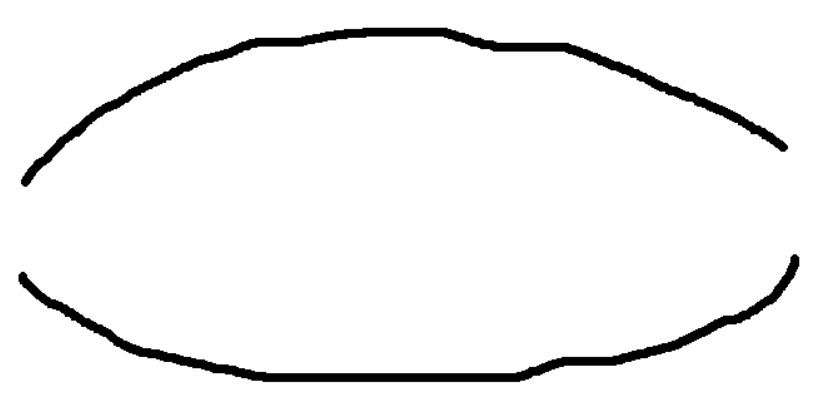
d. *Fry/Fingerlings remain standing.*
e. *Those students choose a number 1-6*

Fry, Fingerling:

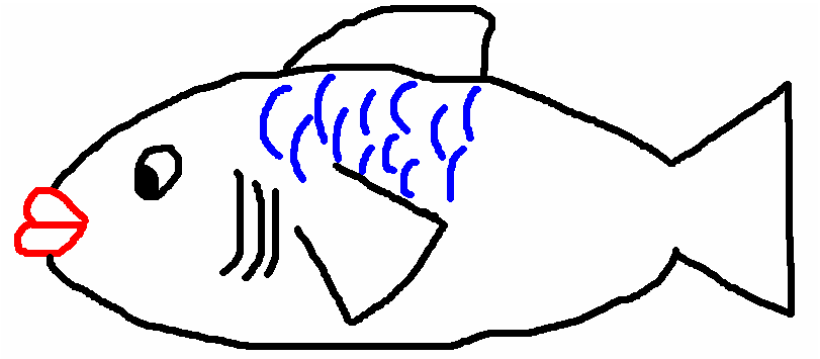
1. A larger fish gobbled you up.
2. An algal bloom used up all the oxygen in your stream.
3. Acid rain caused the pH of the stream to drop below 6.5.
4. You ended up as Hunter Garrett's dinner.
5. Bad news! There aren't enough resources to support the whole population of trout. The carrying capacity has decreased, and you died of starvation.
6. Congratulations! You have reached maturity and are able to reproduce. Go forth and multiply!

Lesson Three: Trout Anatomy

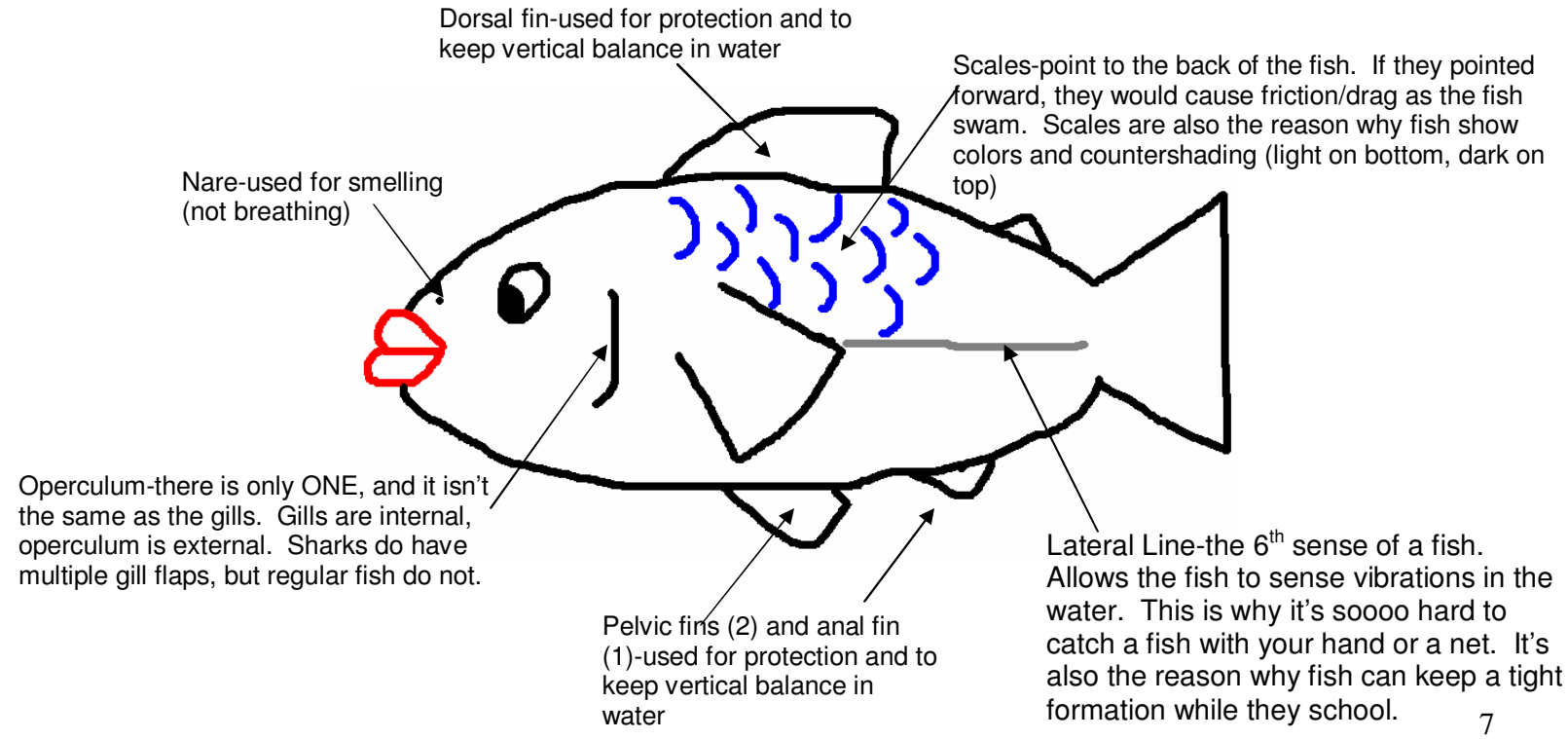
1. Start off drawing the body of a trout on the board and let the kids finish it as a class.



It usually comes out looking something like this…



2. Misconceptions or things they forget/don't know to include…



3. Anatomy Song (sung to the tune of Head, Shoulders, Knees, and Toes)

Dorsal, Pectoral, Pelvic, Caudal, Pelvic, Caudal
Dorsal, Pectoral, Pelvic, Caudal, Pelvic, Caudal
There's the lateral line
Operculum and gills
Dorsal, Pectoral, Pelvic, Caudal, Pelvic, Caudal
And don't forget the anal fin!

Motions
Dorsal (*hands together held at back of head*)
Pectoral (*flap like a chicken*)
Pelvic (*hands waving on either hip*)
Caudal (*point to toes/legs*)
Lateral line (*hands run down either side of body*)
Operculum (*hands on cheeks and flap back and forth*)
Gills (*hands on cheeks with fingers wiggling*)
Anal Fin (turn around, bend over, and wiggle hands on bottom)

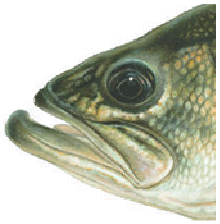
4. Based on the trout anatomy, what is its feeding niche?

- Bottom feeder? top feeder? right-in-front-of-it feeder?
- Ambush predator or predator that chases its food?

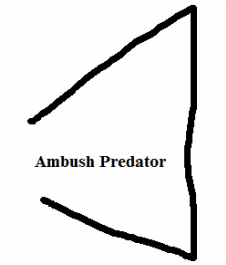
Bottom feeders have mouths that point downward. (ex: catfish)

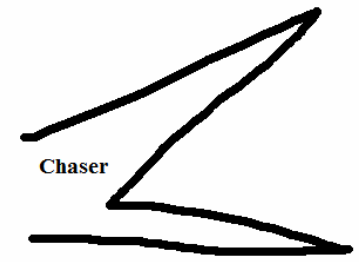
Top feeders have mouths that point up. This does not mean they feed only on the surface of the water…just that they feed on what is above them. (ex: flounder)

Middle feeders (right-in-front-of-it feeder) have mouths that point forward. (ex: bass)



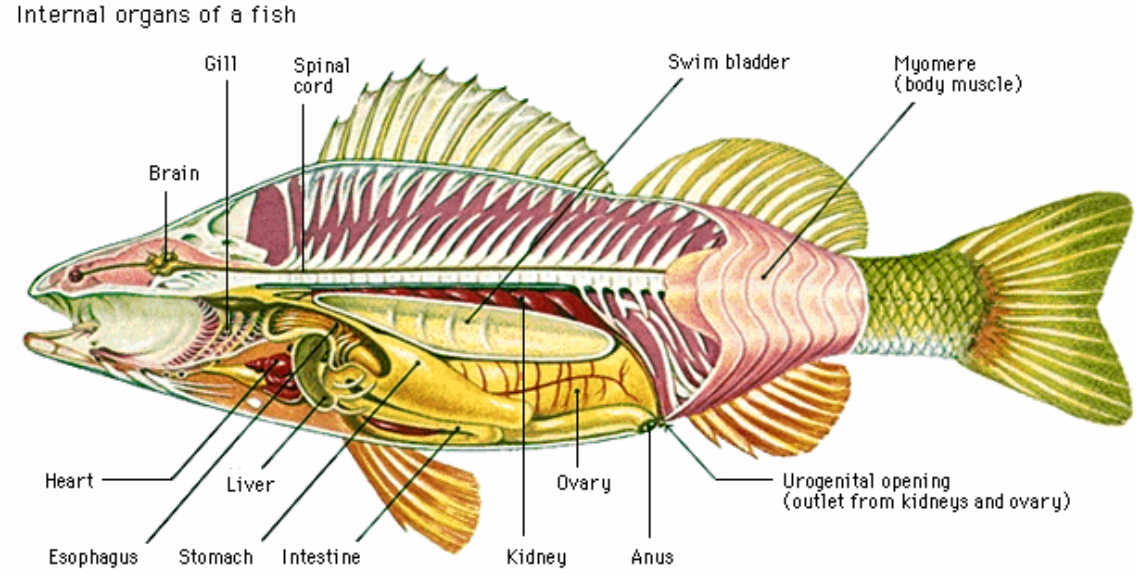
Ambush predators usually have a large, flat caudal fin. Predators that chase their food usually have more of a forked caudal fin. (ex: tuna, sharks)





Trout feeding niche: They tend to be ambush predators that feed on insects and other fish that are right in front of them. This does not mean they cannot feed off of insect on the surface of the water, because they certainly do. It only means that they have to angle their body towards the surface so that they won't miss their prey.

5. Internal Anatomy



Major differences from human anatomy:

- 1 intestinal tube versus small/large intestines
- Gills versus lungs
- 2 chambered heart versus 4 chambered heart
- Brain is most developed for senses rather than thinking/decision making
- Presence of swim bladder

6. Update Trout Data in journal

7. Journal Entry: Write about the changes that you have observed in our fish so far.

Lesson Four: Trout Genetics

1. Review Genetic Terms
    a. Heterozygous/Homozygous
    b. Allele
    c. Trait
    d. Gene
    e. Phenotype/Genotype

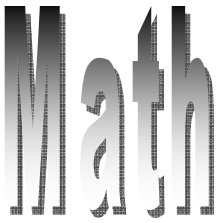
2. Genetic Activity – See page 11.

3. Draw a Punnett Square for the back shape trait in Journals.

	B	b
B	Bb	Bb
b	Bb	Bb

4. Update Trout Data in Journal

5. Journal Entry: How does your class percentages for body shape compare to what you would find in the wild (Punnett Square)?



Probability

Trout Genetics

Student work in partners

Materials:

- Copy of chromosomes –
    - One male copy of dominant and one male copy of recessive (blue paper).
    - One female copy of dominant and one female copy of recessive (pink paper).
- Envelope to hold the chromosomes
- Copies of trout bodies and traits (printed on tan and gray paper)
- Pink and blue construction paper
- Glue Sticks
- Scissors
- Copies of traits, offspring traits, and classroom total tables

Procedure

1. Imagine two of your classroom's trout surviving and maturing over the next three years. These two parents will spawn and produce a number of offspring.
2. Discuss that each parent is heterozygous for each trait.
3. Review the eight traits that our spawning trout carry. Also go over the sex chromosomes.
4. Each student gets an envelope with the chromosomes.
5. Students arrange both the male and the female chromosomes face down in pairs according to trait (and length). The letter symbol for each trait should not be visible. Keep the male and female chromosomes separate at this step.
6. Each student must randomly pick one chromosome from each of the nine groups.
7. Students fill out the offspring's genotypes in the table. Students refer to the trout traits table to find the resulting phenotype the fry has for each genotype.
8. Students then make their fish based on the offspring's traits. To identify the offspring's sex, glue the fish to either pink or blue construction paper.
9. Students name their fish and place it in the "school" of other fish. (Bulletin Board)

Name _____

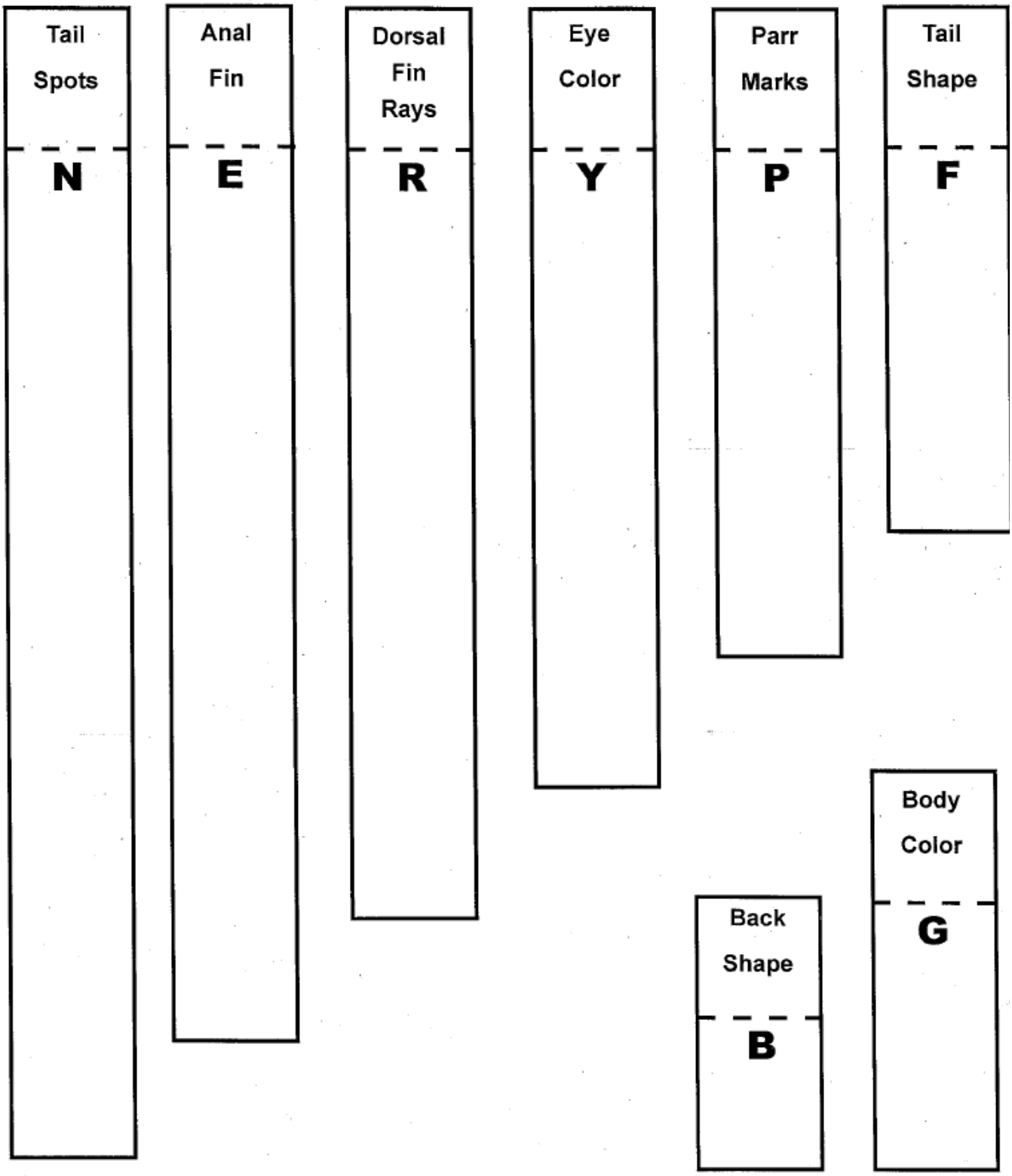
Student Worksheet

Trout Traits					
Characteristic	**Dominant Trait**	**Recessive Trait**	**Mother's Genotype**	**Father's Genotype**	**Possible Offspring Genotypes**
Back Shape	Smooth back (B)	Rounded back (b)	Bb	Bb	BB, Bb, bb
Body Color	Gray body (G)	Tan (g)	Gg	Gg	GG, Gg, gg
Tail Shape	Forked tail (F)	Squared tail (f)	Ff	Ff	FF, Ff, ff
Tail Spotting	Spotted (N)	No spots (n)	Nn	Nn	NN, Nn, nn
Parr Marks	Has parr marks (P)	No parr marks (p)	Pp	Pp	PP, Pp, pp
Dorsal fin rays	6 dorsal rays (R)	3 dorsal rays (r)	Rr	Rr	RR, Rr, rr
Anal fin shape	Elongated anal fin (E)	Short anal fin (e)	Ee	Ee	EE, Ee, ee
Eye color	Yellow (Y)	Green (y)	Yy	Yy	YY, Yy, yy
Sex			XX	XY	XX, XY

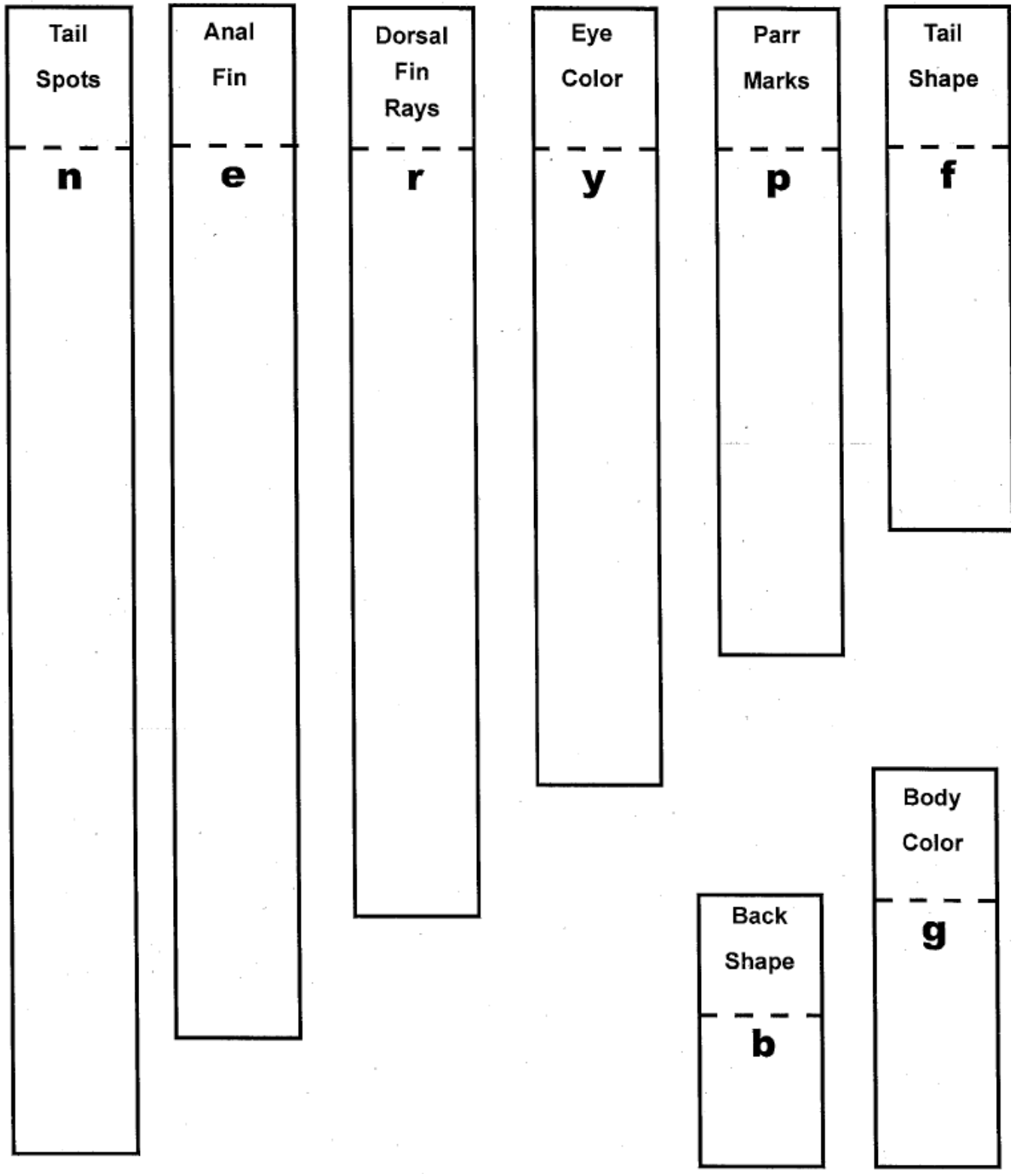
Individual Offspring Characteristics		
Trait	Genotype	Phenotype
Back shape		
Body color		
Tail shape		
Tail spotting		
Parr marks		
Dorsal fin rays		
Anal fin shape		
Eye color		
Gender		

Classroom Totals						
Trait	**Phenotype**	**Genotype**	**No. of fry with genotype**	**% of class total**	**No. of fry with phenotype**	**% of class total**
Back shape	Smooth	BB				
		Bb				
	Rounded	bb				
Body color	Gray	GG				
		Gg				
	Tan	gg				
Tail Shape	Forked	FF				
		Ff				
	Square	ff				
Tail spotting	Spots	NN				
		Nn				
	No spots	nn				
Parr marks	Yes	PP				
		Pp				
	No	pp				
Dorsal fin rays	6 rays	RR				
		Rr				
	3 rays	rr				
Anal fin shape	Elongated	EE				
		Ee				
	Short	ee				
Eye color	Yellow	YY				
		Yy				
	Green	yy				
Gender	Male	XY				
	Female	XX				

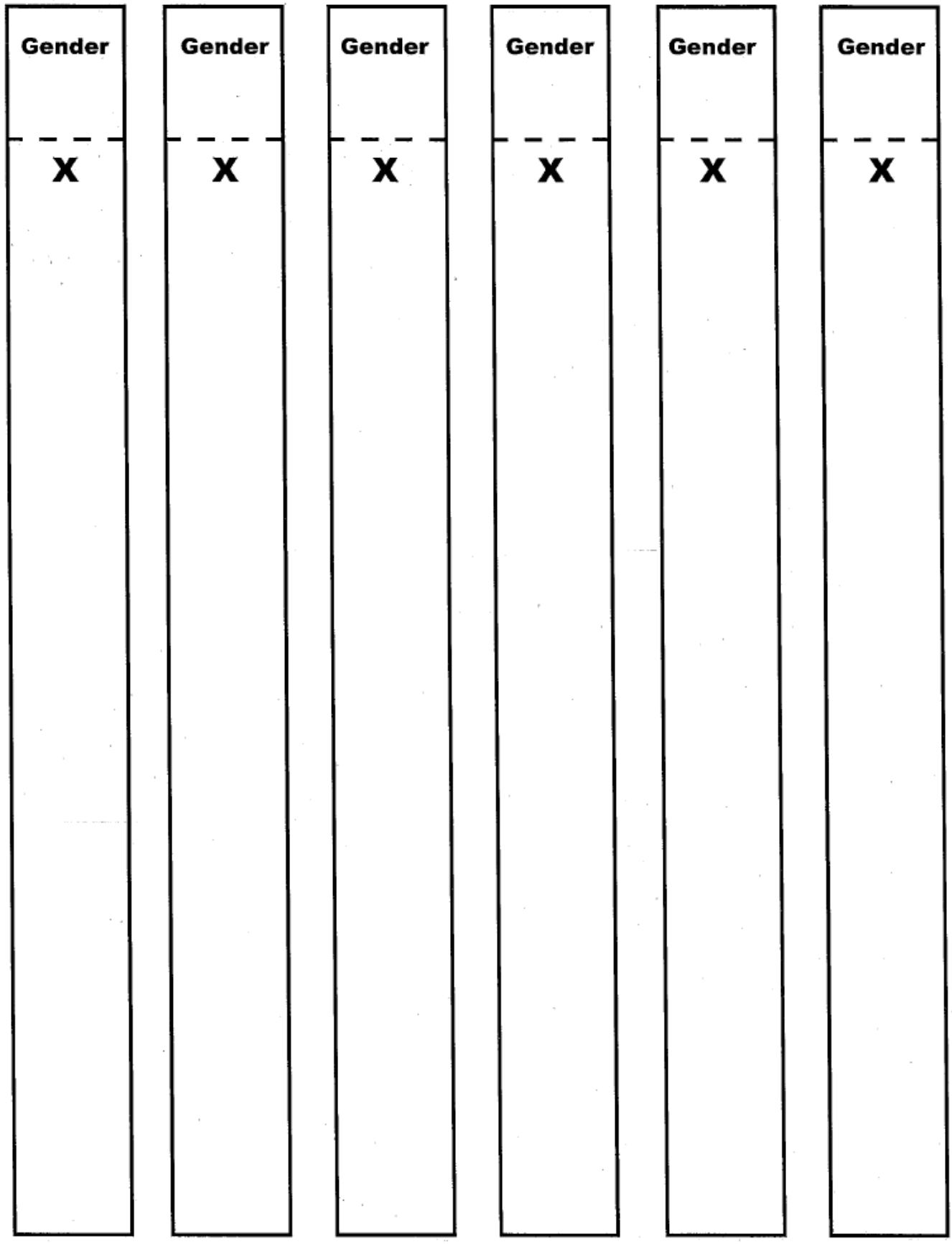
Chromosome Master (Dominant)



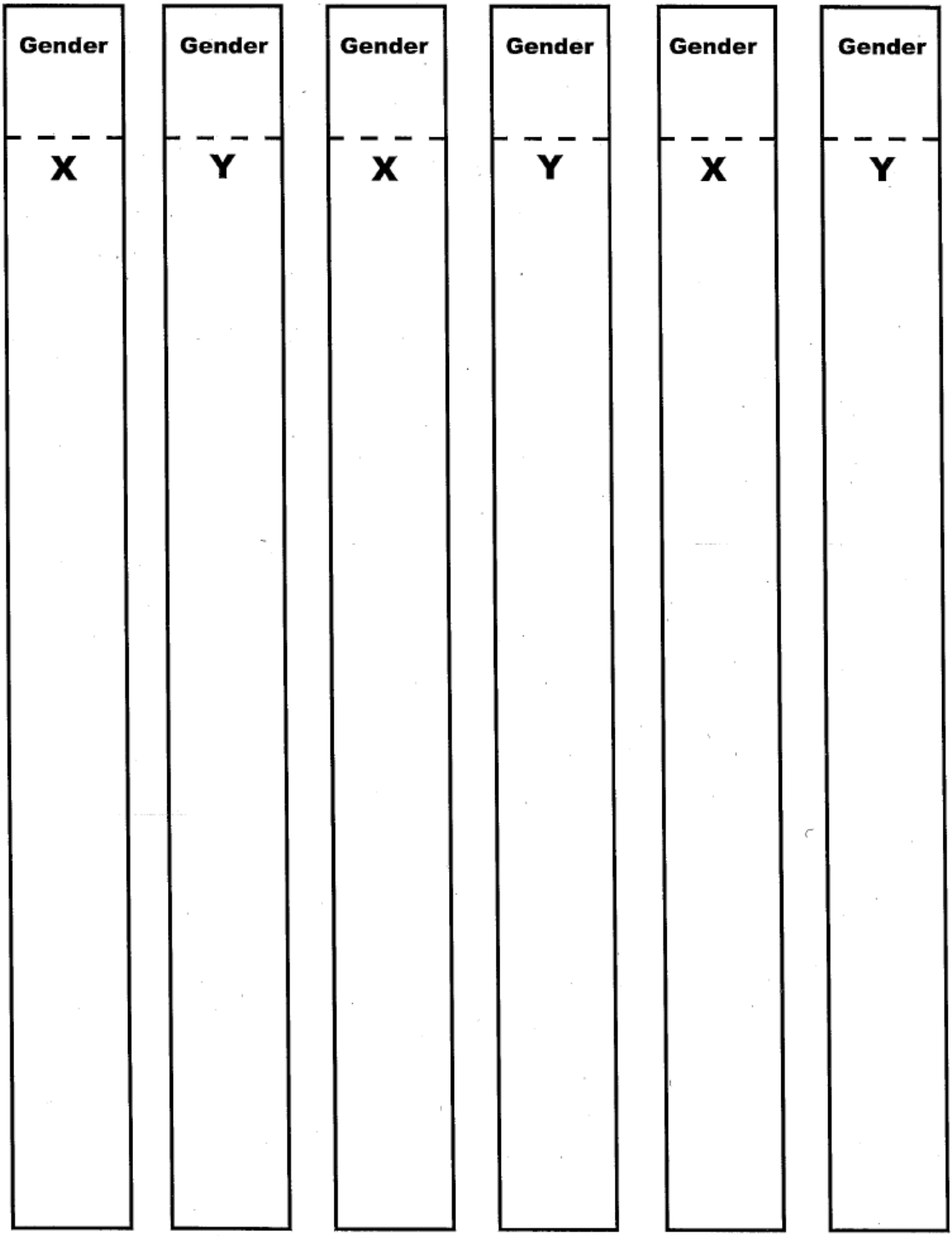
Chromosome Master (Recessive)



Sex Chromosome Master (Female)



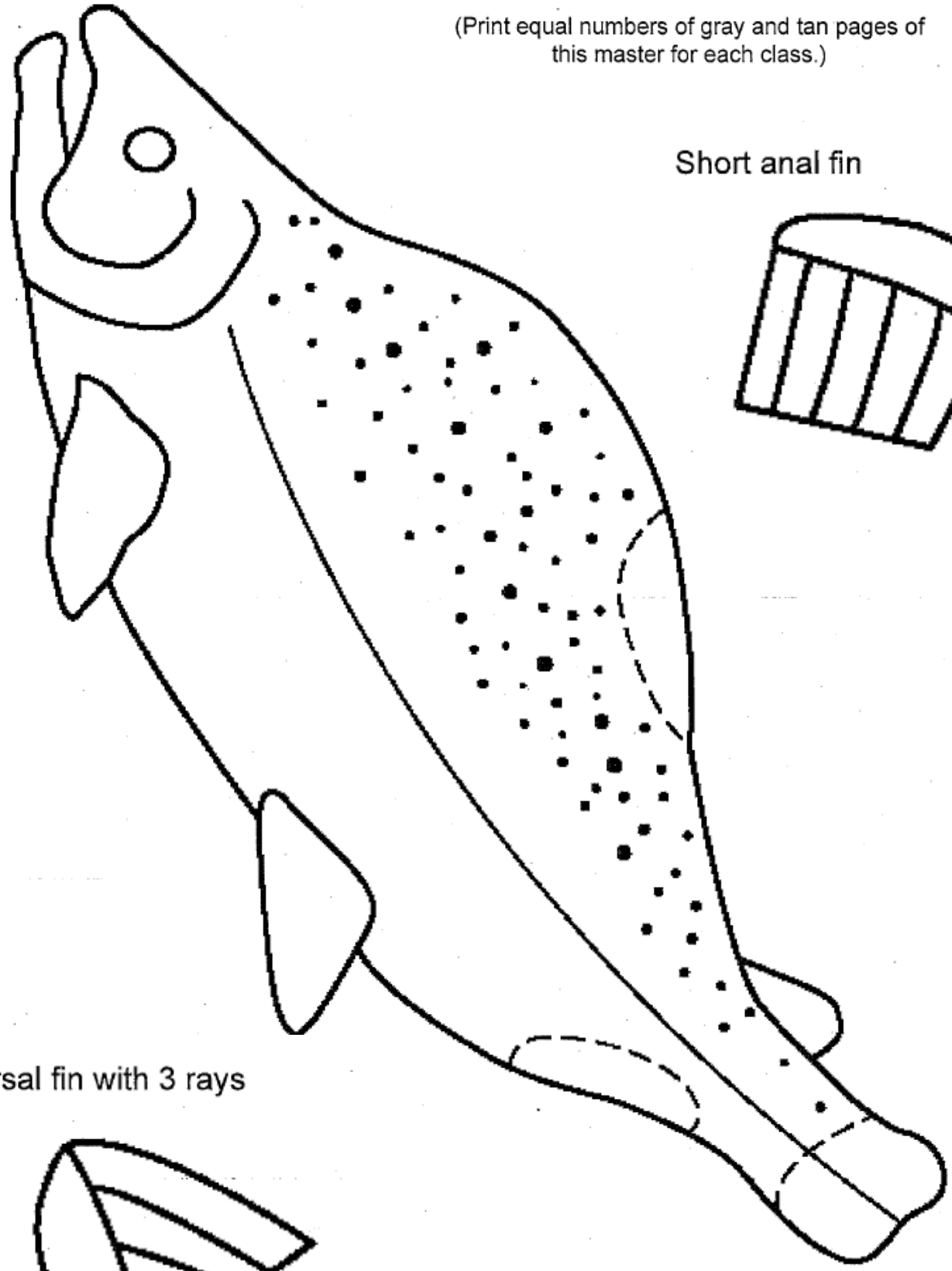
Sex Chromosome Master (Male)



Rounded Back

(Print equal numbers of gray and tan pages of this master for each class.)

Short anal fin



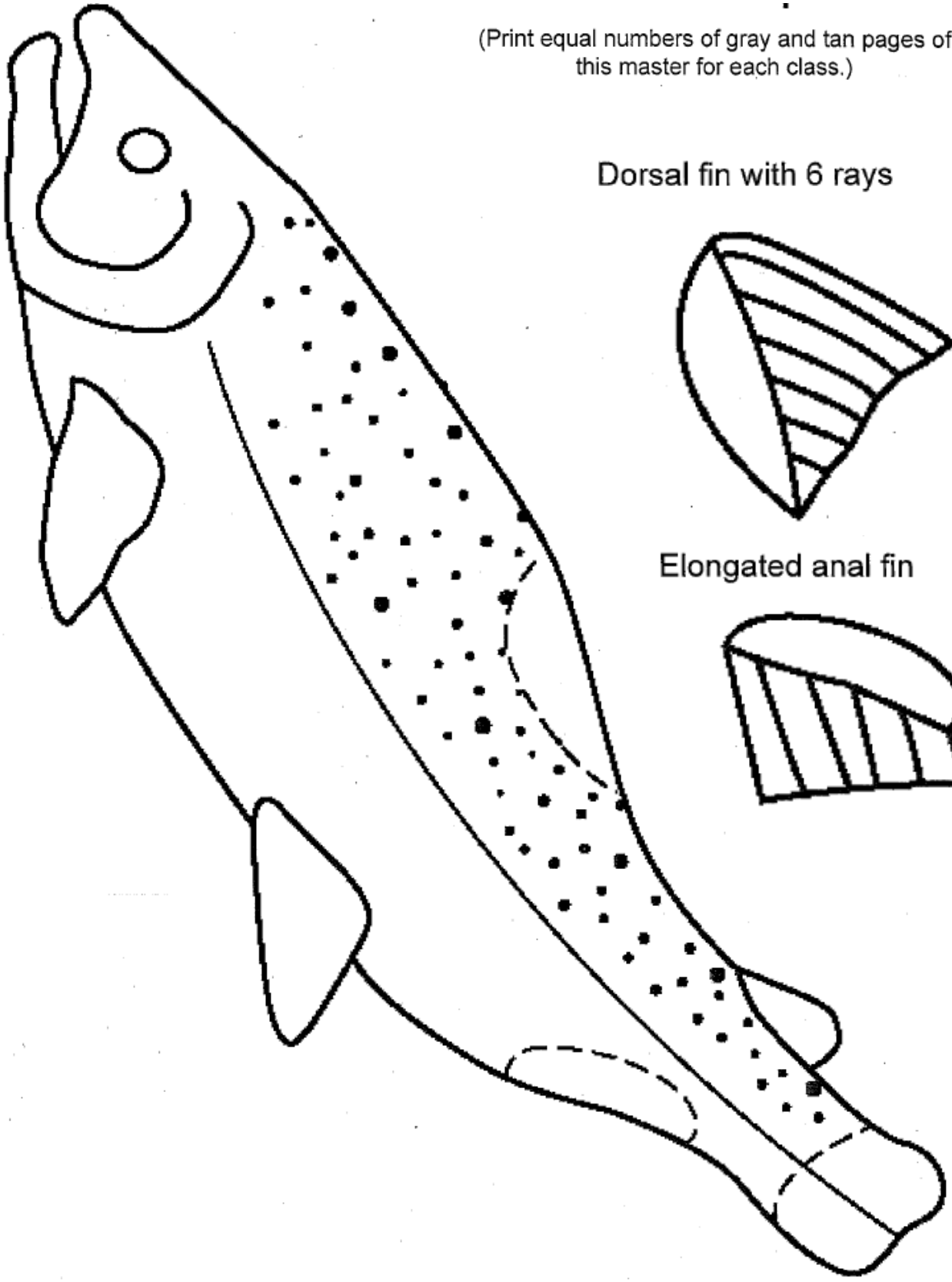
Dorsal fin with 3 rays

Smooth Back

(Print equal numbers of gray and tan pages of this master for each class.)

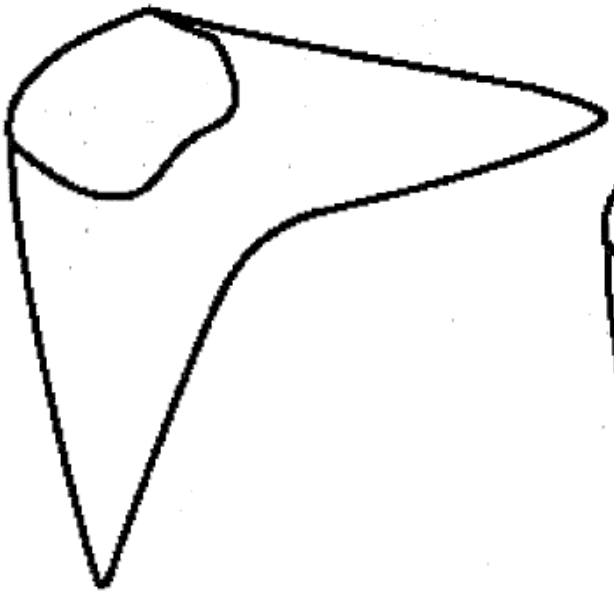
Dorsal fin with 6 rays

Elongated anal fin

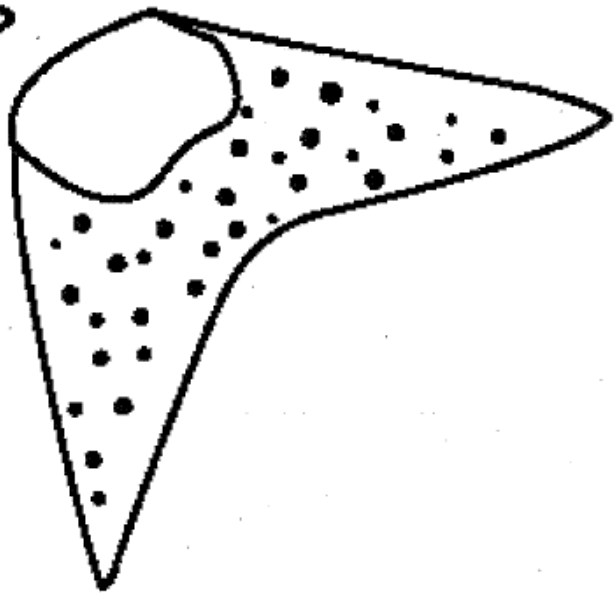


Parr Marks

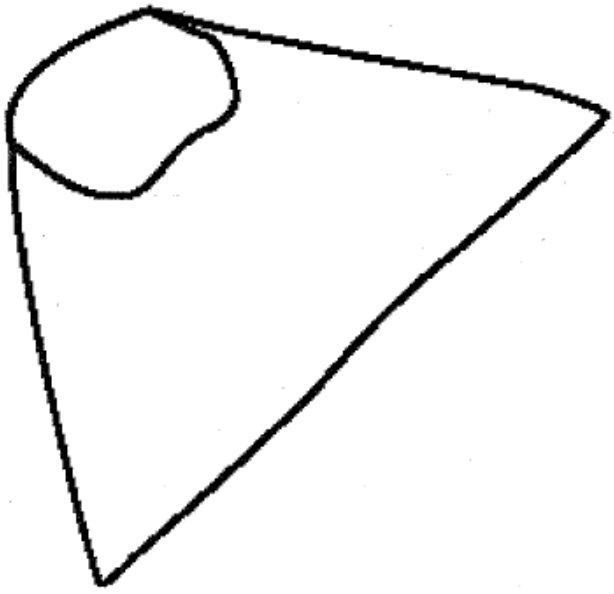
Forked tail without spots



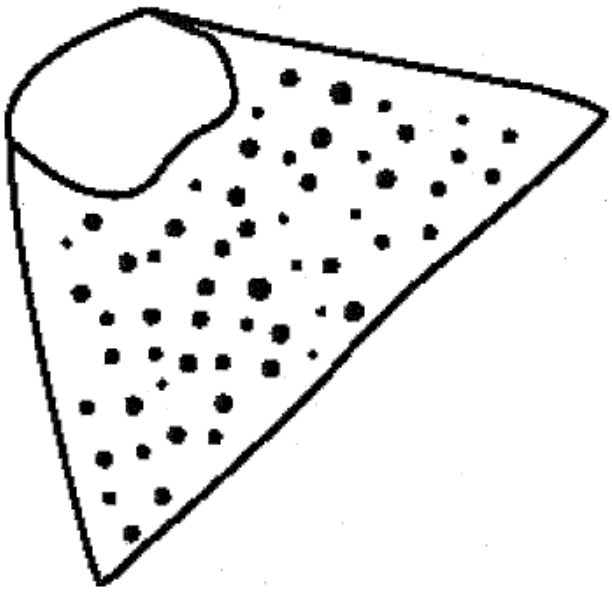
Forked tail with spots



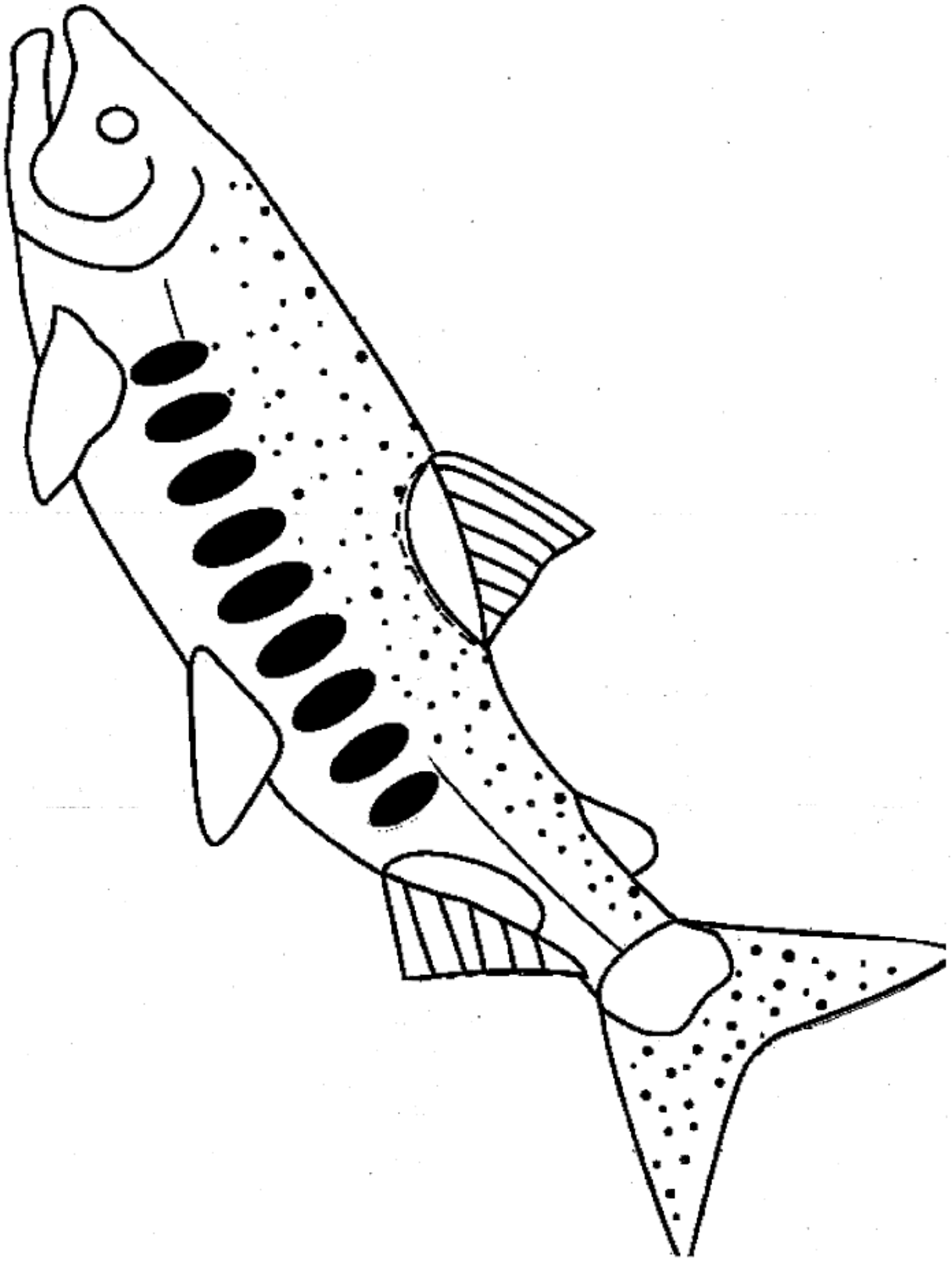
Square tail without spots



Square tail with spots

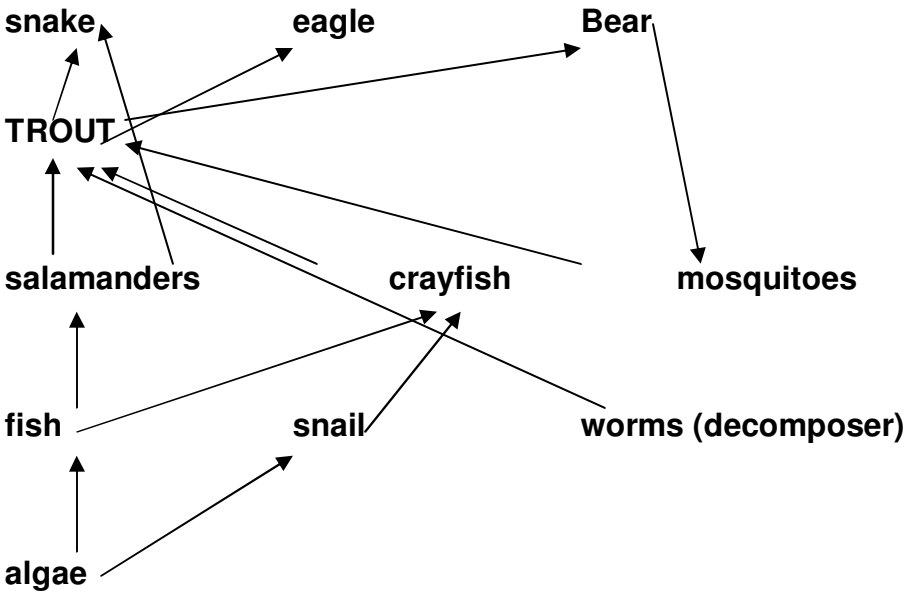


Parent Trout



Lesson Five: Trout Web

1. Draw an example of a trout food web.



2. Bear, Trout, Mosquito – See page 23

3. Update Trout Data in Journal

4. Journal Entry: "When you try to change a single thing, you find it hitched to everything else in the universe." – John Muir
   What does this quote mean in relation to our trout?

Bear, Trout, Mosquito Game

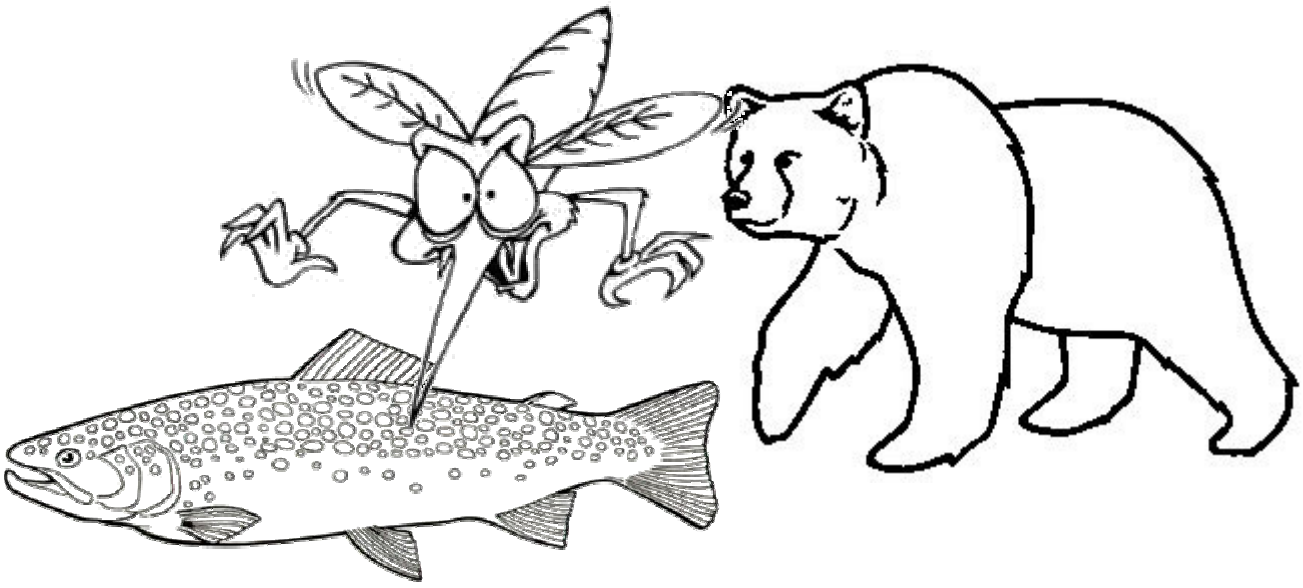
This active game is a fun way to reinforce the food-chain relationships of trout to their predators and prey. It is best played outdoors or in a large, open space. It is a combination of tag and the well-known game, Rock, Paper, Scissors. Instead of using only hands to create the symbols, the players use their entire bodies.

Place boundary lines (such as jump ropes) on the field about 60 feet apart. Place a third midline in the center of the two boundary lines.

Divide the group in half. Have the two groups face each other with the one group on each side of the midline.

Decide on three distinct motions (and sounds) to represent a bear, trout and mosquito. For example: bears roar and flash their claws, trout put their arms over their head and squiggle, and mosquitoes buzz and flap their arms. Discuss the dietary relationships of these predators and prey (bear eat trout, trout eat mosquitoes, and mosquitoes eat bear).

Each group huddles and decides on an animal to "be". The entire group must be the same animal. The groups then line up along the center line again, this time with their backs towards the other team. On the count of three, the groups all yell "Bear, Trout, Mosquito!" then turn around and make the motion for their chosen animal. The predatory group must then chase the prey group. The prey must turn around and run to their habitat (boundary line behind them). If anyone is tagged before reaching his/her habitat, the participant must join the team.

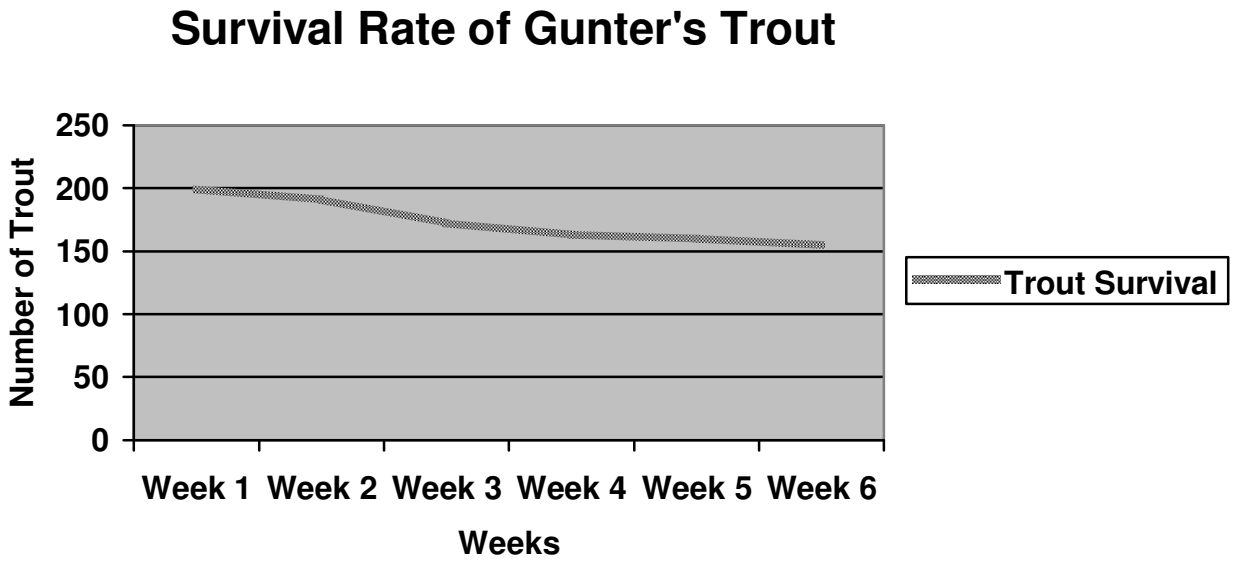


Lesson Six: Trout Data

1. Update Trout Data in Journal

2. Create data table of trout survival over the last six weeks, then use that data to graph Graph trout survival for the last six weeks

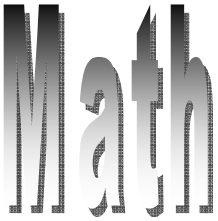
    a. Use a line graph
    b. Make sure to include title, labels, scale



3. Let's say we allowed Mr. Neel to fish in our fish tank. Add weeks seven and eight to your graph with the human population and the new estimated trout population.

4. Journal Entry: Describe the changes you have seen in the fish from day one. Make sure to include the following:

    a. Survival Rate – compared to what you thought it would be in the beginning.
    b. Where are our trout in their life cycle now?
    c. Would we still have this many fish if they were in the wild?



Graph Trout Data using Box and Whisker Plots

Lesson Seven: Hatchery Trip

1. Field Trip to a Fish Hatchery (we go to Walhalla Fish Hatchery).

2. Possible Activities
    a. Hatchery Tour
    b. Trout Dissection
    c. Owl Pellet Dissection
    d. Macroinvertebrate Investigation
    e. Fishing

3. Update Trout Data in Journal

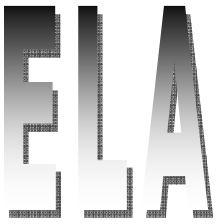
4. Journal Entry: Describe what you saw and learned at the fish hatchery.

Lesson Eight: Release

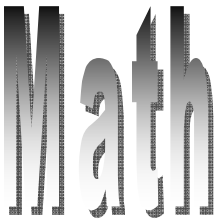
1. Possible release field trip or video of the release.

2. Update Trout Data in Journal

3. Journal Entry: Pretend you are one of our trout; write an essay describing your life from egg at the hatchery to being released by DNR.



Research topic on trout and create a commercial about trout and the economy.



How do trout affect South Carolina economic percentages?

Discuss effects of “New Deal” (Walhalla Fish Hatchery was built)

Discuss economics of trout being stocked in SC.

Daily Trout Inspection

Week of:

Inspectors:

Block:

Date	Temp	pH	Water Clarity	Ammonia	Number of live trout	Mortality	Initials of Inspectors
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							

Daily Trout Inspection

Week of:

Inspectors:

Friday							

Date	Temp	pH	Water Clarity	Ammonia	Number of live trout	Mortality	Initials of Inspectors
Monday							
Tuesday							
Wednesday							
Thursday							

Block:

Trout Mortality

Date	Dead Eggs	Fungus	Dead Fish		Total # Live

Sources:

South Carolina Department of Natural Resources Trout Guide
http://www.dnr.sc.gov/education/pdf/TroutClassroomGuide.pdf

Trout Unlimited: Trout in the Classroom
http://www.troutintheclassroom.org/

Idaho Trout in the Classroom

Bare Books
www.barebooks.com